

Application No. 10/730,162
Paper Dated: August 11, 2008
In Reply to USPTO Correspondence of May 9, 2008
Attorney Docket No. 4444-032065

REMARKS

The Office Action of May 9, 2008 has been reviewed and the Examiner's comments carefully considered. The Specification has been amended to correct a minor typographical error made in the Amendment filed on June 27, 2006, and claims 1, 4, 14, 15, 17 and 20 have been amended in accordance with the originally-filed Specification. No new matter has been added. Claims 1, 2 and 4-20 are pending in this application, and claims 1, 14, 15 and 17 are in independent form.

Initially, Applicants would like to thank the Examiner for reviewing the remarks provided in the previously-filed Response After Final Rejection, dated April 22, 2008. In particular, and after again reviewing the teachings of the previously-cited Ono patent, the Examiner has withdrawn this reference, as it does not teach a diaphragm having a woven base made of an untwisted fiber. However, it appears that the Examiner has again conducted a further search and now refers to U.S. Patent No. 4,078,160 to Bost as including such a teaching. As discussed hereinafter, Applicants disagree with this characterization of the Bost patent.

In the present Action, and after nearly two years of prosecution, the Examiner objects to claims 1, 14, 15 and 17 for certain "informalities." In particular, the Examiner indicates that, while Applicant has claimed a woven fabric of polyethylene naphthalate fiber, wherein the polyethylene naphthalate fiber is an untwisted fiber, the Examiner believes that if the fiber has been woven, then the fibers would inherently be twisted. On this basis, the Examiner believes it is unclear whether Applicants are referring to the individual fibers being untwisted, or the base layer of woven fabric is untwisted.

In response to these claim objections, Applicants submit that the originally-filed specification and present claims clearly indicate that it is the individual PEN fibers that

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are untwisted. Further, it is these individual PEN fibers that make up the "woven" fabric, which is impregnated with a thermosetting resin. Accordingly, Applicants submit that it is clear that Applicants are referring to individual fibers as being untwisted, as opposed to the base layer of woven fabric being "untwisted." However, in the interest of further clarity, claims 1, 4, 14, 15, 17 and 20 have been modified to specifically indicate that the fabric is woven from multiple PEN fibers, and each individual fiber is untwisted. On this basis, Applicants submit that the language in terms in claims 1, 14, 15 and 17 is clear, and withdrawal of the Examiner's objection to these claims in this regard is respectfully requested.

Similarly, and at this late stage of prosecution, the Examiner now objects to the drawings under 37 C.F.R. § 1.83(a), alleging that they do not show every feature of the invention specified in the claims. In particular, the Examiner believes that the woven fabric containing untwisted fiber must be shown or the features cancelled from the claims. Applicants disagree, as it is specifically stated that the base layer is in the form of the woven fabric of polyethylene naphthalate fiber, and this base layer is schematically illustrated in, for example, Fig. 1 (base layer 1), Fig. 7A, etc. Applicants submit that it is appropriate to illustrate such a layer and structure in schematic form, and that the figures correspond with and are fully supported by the originally-filed specification. Further, these originally-filed drawings support the structure, features and components set forth in the presently-pending claims. Accordingly, withdrawal of the objection under 37 C.F.R. § 1.83(a) is respectfully requested.

In the present Office Action, it appears that the Examiner has again reiterated the rejections of pending claims 1, 2 and 4-20 over the prior art cited throughout prosecution of this application, but now substitutes the above-discussed Bost patent for the now

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withdrawn Ono patent. Specifically, claims 1, 2, 4, 6-8, 14 and 20 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent in view of the Mizone and Bost patents. Claims 9-12 and 15-17 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward, Mizone and Bost patents, in view of the Kanada publication. Claims 18 and 19 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward, Mizone, Bost patents and the Kanada publication, in further view of the Yamaji patent. Claim 13 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward, Mizone and Bost patents, in view of the Thomas patent. Finally, claim 5 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward, Mizone and Bost patents, in view of the Inoue and Ogura patents. In view of the following remarks, Applicants respectfully request reconsideration of these rejections.

Summary of the Invention

As set forth in independent claim 1 of the present application, provided is a loudspeaker diaphragm. This loudspeaker diaphragm includes a base layer having a woven fabric, and the woven fabric is polyethylene naphthalate fiber impregnated by a thermosetting resin. Further, the polyethylene naphthalate fiber is an untwisted fiber.

In a further embodiment, and as set forth in independent claim 14 of the present application, the invention is directed to a loudspeaker including a loudspeaker diaphragm. The diaphragm includes a base layer, which is formed from a woven fabric of polyethylene naphthalate fiber impregnated with a thermosetting resin. The polyethylene naphthalate fiber is an untwisted fiber.

In a further embodiment, and as set forth in independent claim 15 of the present application, the invention is also directed to a method of manufacturing a loudspeaker diaphragm. This method includes the steps of: impregnating a woven fabric of a

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polyethylene naphthalate fiber with a thermosetting resin and curing the thermosetting resin, thereby forming a base layer; adding inactive gas in a supercritical state to a molten thermoplastic resin and extruding the mixture of the thermoplastic resin and the inactive gas at prescribed temperature and pressure, so as to form a thermoplastic resin layer; and laminating the base layer and the thermoplastic resin layer. Again, the polyethylene naphthalate fiber is an untwisted fiber.

In yet another embodiment, and as set forth in independent claim 17 of the present application, provided is a loudspeaker diaphragm, which includes a base layer as the outermost layer, as well as a thermoplastic resin layer and a thermoplastic elastomer layer. The base layer includes a woven fabric of polyethylene naphthalate fiber impregnated with a thermosetting resin. This polyethylene naphthalate fiber is an untwisted fiber.

The Cited Prior Art

As discussed above, the Examiner has reformulated and repeated the rejections of the pending claims in view of various combinations of the previously-cited Ward patent, Mizone patent, Kanada publication, Yamaji patent, Thomas patent, Inoue patent and Ogura patent. As evident in the above section "Summary of the Invention," each of independent claims 1, 14, 15 and 17 of the present application include the feature: "wherein the polyethylene naphthalate fiber is an untwisted fiber." As discussed, the Examiner has withdrawn the use of the Ono patent as allegedly teaching this limitation, and now includes a new reference, namely the Bost patent.

The Bost patent is directed to a piezoelectric bimorph or monomorph bender structure. In particular, this structure includes a woven mesh of conductively coated stiff filaments affixed between an element deformable in response to an applied electronic signal and an element of the same configuration, also electrically deformable. In this manner, the

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PAGE 13/13 * RCVD AT 8/11/2008 4:38:38 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-4/21 * DNIS:2738300 * CSID:412 471 4094 * DURATION (mm-ss):14-52

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